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ABSTRACT

The essence of PLAN, a Program of Learning in Accordance with Needs , is individualized instruction. To maximize individualization in instruction, allowances must be made for differences not only in amount, rate, and sequence of content presentation, but also in what content is to be chosen for presentation. Such a program obviously requires an extremely flexible curriculum structure. This paper reports on (1) the problems encountered in the design of such a curriculum, (2) the delivery system for use with that curriculum, (3) the effectiveness of the decision paradigm whereby the curriculum is fitted to the particular needs of individual students, and (4) the operating characteristics of the instructional system. In brief, approximately 2,000 separate, independent teaching-learning units have been developed and are in use in the individualized programs of study for approximately 9,000 public school children in systems from New York to California. (Author)

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THE PLAN APPROACH TO CURRICULUM DEFINITION

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THE PLAN APPROACH TO CURRICULUM DEFINITION

Project PLAN is relatively young as far as research and development projects go. In a little over three years it has grown from an untried concept to an operating program spanning grades 1 to 12. In September, 1970 PLAN is expected to be in use with 40,000 students in school systems ranging from New York to San Francisco, from Chicago, Illinois to Parkersburg, West Virginia.

The acronym "PLAN" stands for Program of Learning in Accordance with Needs. The essence of PLAN is individualization. Individualization has long been a goal of education. Washburne, in the 24th NSSE yearbook entitled Adapting the Schools to Individual Differences, has written: "It has become palpably absurd to expect to achieve uniform results from uniform assignments made to a class of widely differing individuals. Throughout the educational world, there has therefore awakened a desire to find some way of adapting schools to the differing individuals who attend them." While these words have the ring of indictment and exhortation that is very much a part of the activist scene today, they were written almost half a century ago.

In spite of an abiding concern for individualization, education doesn't seem to have moved very far in that direction. In recent years the ERIC Documentation System has classified over 1900 references dealing with curriculum. Only 36 have anything whatsoever to do with: individualized curricula, individualized programs of study, individualized education, or the like. Of these 36, approximately half deal with some form of programmed instruction.

One of the biggest obstacles to individualized education is the difficulty of classroom management. To accomplish individualization, the services of a computer system are clearly required. The teacher must be relieved of the record-keeping burden associated with individualized assignments, program coordination, student progress monitoring, test scoring, and myriad other clerical chores.

PLAN is an ungraded, computer-supported, individualized program of education. It has its origins in some of the findings of Project TALENT, a 20-year longitudinal study of almost half a million secondary school students in the United States.

Three of the major deficiencies in present educational patterns either identified or underscored by Project TALENT are: 1) current curricula and instructional methods are only moderately responsive to the specific needs of students, and bear little relevance to the interests, goals, and objectives of students, 2) the curricula are practically unaffected by empirical investigations of the appropriateness and effectiveness of instructional methods in relation to various types of materials, and 3) schools generally fail to assist students in developing a sense of responsibility for their educational and personal development.

The curricular dimensions and administrative structures used to individualize students' educational programs have remained essentially unchanged since the recommendations of the Committees of Ten and Fifteen in the 1890's (Sizer, 1964). Their recommendations were very simple and, with only slight modification in 1918, set the mode of secondary education for over half a century. In essence, the recommendations called for the establishment, and standardization, of a set of core courses which would comprise the educational base for all students. Collateral with these basic requirements

would be an array of elective courses from which the student would select on the basis of interest.

Elaborations on this paradigm have included tracking, homogeneous grouping, platoon systems, and tutorial programs. Counter variations were heterogeneous groupings, unified studies, self-contained classrooms, and the like.

The Committee recommendations, then, called for the individualization of programs by permitting differential content exposure. The unit of content exposure was the "course." This pattern is still the standard educational procedure used today. Clearly, some alternative must be available to replace current educational patterns which are predicated on courses of study given to groups of students at a rate and via a mode of presentation that is constant for all members of the group.

The progressive movement of the thirties sought individualization by allowing a maximal amount of self-selection in the program. In the fifties, programmed instruction held content constant and allowed learner rate to vary. This was quickly followed by branching which allowed some, albeit not much, content variation. More commonly, branching was seen as a way to vary step size and step difficulty rather than content.

Wilhelms, in the 1962 NSSE yearbook Individualizing Instruction, after an extensive review of the major educational programs laying claim to accommodating individual differences, concluded that "there has been far too much tendency to individualize with respect to little more than rate of progress...and one must have a meager conception of individualization to settle for students merely being able to do the same things at a different pace."

To truly individualize instruction, type of content, amount of content,

rate and sequence of content, and methods of instruction must all be allowed to vary. In a truly individualized educational program, different students should be allowed to study different content, in different amounts, at different rates, and via different methods.

Individualized educational programs must consider among other things:

1) what the student needs to know,
2) what the student would like to know,
3) what the student already knows,
4) the rate at which the selected content should be presented,
5) the sequence in which that content should be presented,
6) the mode of presentation of that content,
7) the difficulty level of the learning materials used to teach that content,
8) the nature of the physical and social context in which the teaching-learning takes place;
9) the amount of teacher supervision, media usage, and technology involved, and
10) the amount of overlearning, and/or periodic review, built into the program.

To do this it is necessary to move toward an ungraded program, toward individualized rather than group testing, and toward criterion normed rather than group normed tests. This is the pattern of PLAN. Such a program imposes special requirements on the curriculum, however. It is the purpose of this paper to identify those requirements, to discuss how the curriculum was developed, and how that curriculum gets translated into a highly personal program of study for each PLAN student.

PLAN did not set out to create a new curriculum, or even to revise a curriculum. There are many fine curriculum projects which have been underway for some years. If one looks at the instructional resources commercially available, one cannot help but be impressed with their richness. PLAN asked, rather, "How could the best curriculum materials available be utilized in a way that would be amenable to individualization?"

One may consider curriculum from two points of view--from the materials, or supply, point of view and from the student, or consumer, point of view. On the one hand, the curriculum is defined as the totality of the instruction the school system is prepared to offer. On the other the curriculum is that which the student studies. To the extent that one has true individualization of an educational program, one has as many curricula as students.

Thus, PLAN's goal was to devise a way in which the best currently available instructional materials could be organized to be more readily amenable to individualization and to empirical evaluation.

In the identification of the salient curriculum concepts to be included the following sources of information were used: 1) a review of the curriculum literature; 2) a content analysis of currently used textbooks and state curriculum guides; 3) recommendations and judgments from experienced teachers; 4) the recommendations of four national curriculum advisory panels; 5) standardized student test results; and 6) formative research data derived from the use of materials in Project PLAN.

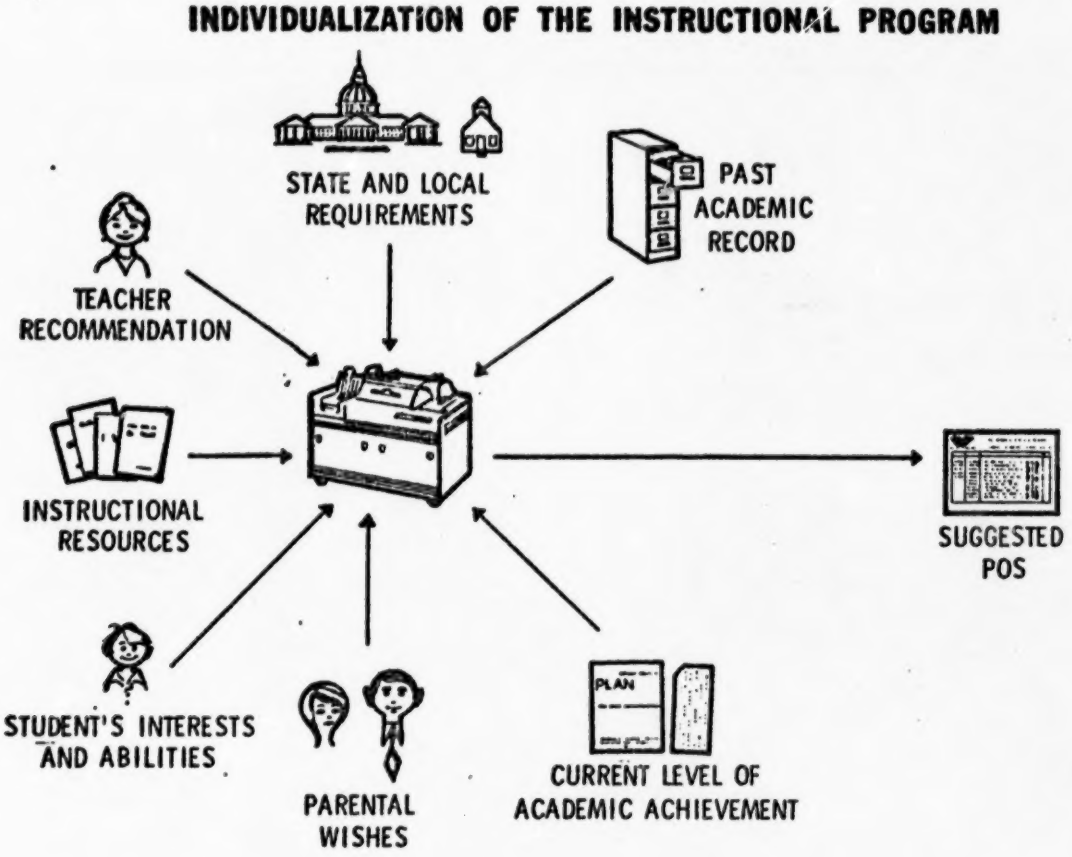
On the strength of these inputs, teaching-learning units were developed which referenced commercially available materials. Each TLU covered approximately five behavioral objectives and took approximately ten hours of class time to master. In all, approximately 6,000 behavioral objectives have

been incorporated into approximately 2,500 independent teaching-learning units. This figure represents approximately 3 times as many lessons as a typical student would normally be expected to take in his 12 years of public education.

Given the extent of these materials it then became necessary to create guidelines as to how to sample from this instructional domain so as to create the most reasonable programs of study (POS's) for students.

It is through the program of studies, the individual curriculum if you will, that individualization of a student's education takes place. The following figure indicates the sources of input into the POS.

FIGURE 1



State and local requirements. State and local requirements receive first priority in the generation of a student's program of studies. Clearly, school systems using PLAN must have a mechanism whereby their requirements

receive special attention. The collection of information regarding state and local requirements is the responsibility of PLAN personnel. This is a fairly simple and straightforward procedure, but one which may not be taken lightly. That is, school systems should be very careful that what they indicate is in fact actually required because students are held strictly accountable for what is specified. Casualness in the statement of state and local requirements can have broad implication. In one state, for example, the study of American government is required as a condition for graduation from high school. This is typically interpreted as a semester of civics at the senior year. The reasoning is quite clear. The semester is the smallest unit of instruction that a traditional high school can conveniently accommodate, and also, since it is a requirement, it is easier to manage if it is deferred until just before graduation. It would be a mistake for a school superintendent in PLAN to continue to indicate his state's requirement as a semester of 12th grade civics. This type of rigidity is no longer necessary. The study of American government in PLAN can be either modest or extensive, depending on a student's interests and abilities, and it may be taken at almost any time during high school.

Students' interests, abilities, and parental wishes. The next main source of input for POS generation is student-parent educational and vocational long range goal information and the student's interests and developed abilities. This information is derived from PLAN tests and student-parent worksheets and questionnaires. The information is then used to select the modules that will be recommended to the student.

Instructional resources. Each of the 2,500 teaching-learning units in PLAN has been assigned an average of 45 different index numbers to describe its level of difficulty, the priority and sequence it should receive

in POS assignment, instructional characteristics, and the like.

Past records. After the modules have been tentatively selected for a student's POS, a search of the student's past academic record is made to ascertain whether he has completed any of those modules, or whether he has any required modules left from the preceeding year that he must make up before he goes ahead.

Achievement test results. Next, the student's most recent achievement test results are reviewed to ascertain a tentative level of placement at which the student should begin. The POS procedure then prorates the balance of the modules across the remaining number of years the student plans to study that particular subject.

Quota. This prorata estimate is balanced against a module quota for each student which is computed from his level of developed abilities and his demonstrated rate of progress from the preceding year. If his quota exceeds the prorated estimates, the student is either assigned enrichment or probable interest modules, or allowed to accelerate into modules at the higher level, depending on the teacher's judgment and the student's wishes. If, on the other hand, his calculated quota is less than the prorated modules required for his long range goals, a special message will be printed for the student advising him of that fact and counseling him that, given his expressed goals, in order to achieve the educational preparation considered necessary, he should plan to either a) revise upward the total number of years he expects to spend studying in that area; or if that is impossible, b) increase the amount of time and effort he will devote to the study of that subject in the time he has left.

Teacher recommendation. Finally, after all these input factors are considered, the procedure turns to the professional judgment of the teacher.

It is the teacher who provides the basic data about the efficiency of each student's learning styles, special placement requirements and the like; and it is on this information that student-TLU matching takes place.

This, then, is the mechanism whereby PLAN draws upon its library of available instructional resources. The first version of this procedure has been in use for almost a year so comments regarding its operation are in order.

First, the amount of special material needed to support a 1 to 12 ungraded system like PLAN is enormous. There are over 4,000 printed documents necessary for PLAN operation. These documents include such things as TLU's, module tests, teacher guides, teacher training materials, student orientation materials and the like. A typical PLAN classroom receives two fork-lift loads of supplies. This is exclusive of the textbooks, maps, audio-visual equipment and other support material necessary for the instructional program in the classroom.

Second, the amount of indexing and cross-cataloging of materials to accomplish individualization is also enormous. Over 70,000 binary codes had to be assigned to the 450 secondary modules alone. As one would expect, this coding was not accomplished without a certain measure of occasional arbitrariness. When one is called upon to critically examine each and every lesson of an entire educational system to try to relate those lessons to anticipated student interests, goals and aspirations, as well as to their educational needs, one is confronted time and again with how little relevance there appears to be between that which is considered an "educational" requirement (that which is presumably necessary for success at the next higher level of education) and that which can be considered important for the exercise of responsible citizenship and the

pursuit of vocational and avocational goals.

Often the coding decisions reduced to the curriculum designer asking "Is this module really necessary?", and the subject matter specialist responding "The program wouldn't be complete without it."

I might add that our four national curriculum advisory panels reflected even more concern over the "traditional" curriculum than we did.

Third, the key to efficient POS generation is in how the individualization rules are approached by the computer. Initial POS efforts were reasonably naive. The problem was attacked in a straightforward, module by module manner. As a result it took approximately ten hours to generate POS's for only 2,000 secondary students. This year by batching certain computer decisions, by developing variable file creation procedures and the like, a material reduction in computer processing time is anticipated.

Fourth, there is a marked difference in the degree to which teachers tend to follow the suggested program of studies. Some teachers follow it quite closely making only occasional modifications. Others make more frequent modifications. The implications of this are considerable. To the extent that a teacher changes a student's POS on the basis of personal preferences for content, for administrative expedience, or whatever, the risk of the student studying an uncoordinated potpourri of lessons is very real. Thus, the success of an individualized instructional program such as PLAN's, with all of the curricular power it entails, is in large measure a function of the effectiveness of its teacher training program. Clearly, the teachers who use, and will be using, PLAN must be oriented to the theory and rationale of the system as well as to its mechanics.

Fifth, POS generation obviously can be no better than the data on which it is generated. If teachers, parents or students are careless or

derelict in reporting data, the appropriateness of the computer suggested Program of Studies is attenuated. One advantage of the POS system, however, is that it accommodates a much larger array of data inputs than schools have traditionally considered. As a result, error or misunderstanding on the part of one party has far less impact than it has had in the past because in the POS procedure that error tends to be modulated by other inputs. To this extent the POS operates to protect the student's interests.

For example, to the extent that a student and/or his parents were poorly informed about vocational opportunities and their associated educational requirements, the student's long range goals and his expressed educational plans may be at variance.

Last year PLAN operated without benefit of a very extensive guidance program. Students had to formulate goals and develop plans in much the same way they have always had to do so; that is, without much external help. In an analysis of the vocational goals and educational plans formulated by the almost 2,000 PLAN students last year, it was found there was no relationship between them. 54% of the PLAN students, and their parents, (and there is no reason to believe that PLAN participants were inadvertently selected on this basis) indicated vocational goals that required a college education, but, at the same time indicated that they did not plan to attend college. (See Table 1.) Two possible explanations immediately come to mind: one, that the students and/or their parents had unrealistically high vocational goals; or two, that they were so poorly informed about the requirements for entry into those vocations that in many cases parents and students did not know that a four year college education was required. Additional PLAN data tend to support the latter.

When the vocational goals chosen by students and their parents were

compared to the vocational categories predicted for these students using regression equations based on TALENT data and the results collapsed to a two-way joint frequency table, it became apparent that the unaided planning of parents and students was, in fact, reasonably good. (See Table 2.) 63% of the parents made selections which were essentially the same as the data based recommendations. 36% appeared to either over-aspire or under-aspire, given the data suggested goals as the criterion. What is further interesting is that almost as many chose vocational goals below their level of ability as above it.

These data are expected to be considerably different for the 1970 PLAN students. This time next year a special guidance strand involving approximately 25 hours of instructional time, dealing with vocational information and long range goal formulation, will be provided all secondary PLAN students so student-parent planning can be expected to be somewhat more systematic and informed.

To return to the original issue however, in most schools the students' and parents' educational aspirations would have been accepted on face value and those students not indicating college aspirations would probably have been placed in shop, business, or general programs. With the passage of each school year the decision to go to college would have become harder and more inconvenient to make.

It is one of the functions of the POS procedure to recognize the potential of youngsters and to recommend a program of study which will maintain as many options as possible open to them for as long as possible. The goal of the POS is to avoid unnecessary, and perhaps inadvertent, premature closure on educational opportunities for the student. It is this function of the POS that, if nothing else, would more than justify the effort.

TABLE 1

Student-Parent Educational Goal	Student-Parent Long Range Goal Category: College	Non-College	Total
College	538 28%	121 6%	659 34%
Non-College	1035 54%	221 12%	1256 66%
Total	1573 82%	342 18%	1915

χ^2 = 12 with 1 d.f.

TABLE 2

Data Suggested LRG Category	Student-Parent Long Range Goal Category: College	Non-College	Total
College	681 50%	22 16%	903 66%
Non-College	278 20%	184 13%	462 33%
Total	959 70%	406 29%	1365

χ^2 = 33.25 with 1 d.f. $p < .001$

APPENDIX

SAMPLE POS AND TLU'S

PLAN

PROGRAM OF STUDIES AND STUDENT PROGRESS REPORT FOR

060030-02-0 SCHOOL **ADDISON** TEACHER **MRS. ETHEL BARKER** SUBJECT AREA **MATHE**

COMPLETION CODE	MODULE NUMBER	MODULE NAME
COMPLETED	30-101-0	INTERACTION
COMPLETED	30-102-3	SYSTEMS
COMPLETED	30-103-3	EVIDENCE OF INTERACTION 1
ACTIVE	30-104-3	EVIDENCE OF INTERACTION 2
		ANY 1 OF FOLLOWING 2 MODULES
	30-105-3	MAGNETIC INTERACTION
	30-106-3	ELECTRICAL INTERACTION
		ANY 1 OF FOLLOWING 2 MODULES
	30-124-3	FOOD CHAIN
	30-126-3	GROWTH
	30-125-3	BIRTH
	30-100-3	REVIEW OF OBJECTS, PROPERTIES, AND MATERIALS
	30-123-3	WE STUDY THE AQUARIUM
	30-127-3	WHAT IS SOIL
	30-128-3	HOW PLANTS AND SOIL INTERACT
	30-129-3	HOW ANIMALS AND SOIL INTERACT
	30-136-3	ROLLERS, WHEELS AND GEARS
	30-137-3	PULLEYS
		IN ADDITION TO THE MODULES ABOVE SELECT 1 MORE MODULE OF YOUR CHOICE FROM THE SCIENCE AREA.